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Occurrence of whale sharks along the Indian coastline: Challenges and conservation efforts

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ABSTRACT

Although endangered, whale sharks are found worldwide in warm water regions. Their continued existence depends entirely on conservation efforts. In the current study, a whale shark sighting was recorded off the coast of Andhra Pradesh along the east coast of India during a marine faunal assessment in the area. To assess the current habitat range of this species and increase awareness for future conservation efforts along the east coast of India, where conservation initiatives are lacking, a comprehensive review of whale shark sightings and their status has been conducted. This review utilizes existing literature sources covering the Indian coastline over the past decade.

Keywords: Conservation, East-coast, India, *Rhincodon typus*, Whale Shark

1. INTRODUCTION

The whale shark (*Rhincodon typus* Smith 1828) is the largest fish in the world. The species is a transoceanic migratory fish habituated globally in the tropical, subtropical, and temperate waters. Global studies on *R. typus* are gaining importance, but understanding of its ecology and life stages remains limited due to its epipelagic and neritic nature as well as its high migration rate (Rowat et al., 2008). In 2016, the IUCN declared whale sharks as 'Endangered' based on abundance data (Pierce and Norman, 2016). Efforts to protect this species from extinction over the last two decades led to a significant milestone in 2021, when its status was upgraded to the "Largely Depleted" category with a 29% species recovery score (Pierce and Norman, 2016). The significant decline in shark populations in Indian waters can be attributed to the global high demand for shark flesh and fins (Pravin, 2000).

However, the surface swimming nature of whale sharks is intensifying accidental death through collision with boats and entangling on nets (Akhilesh et al., 2013). Therefore, the whale sharks are protected in Indian waters under Schedule-I of the Indian Wildlife (Protection) Act – 1972. Still, the incidental by-catch and accidental deaths of whale sharks are pretty common even nowadays from the Indian coasts. Due to the vastness of the Indian coastline, a significant part of these impacts on whale sharks are not appropriately reported. However, efforts by the government and NGOs to educate fishermen about the conservation of this species and to provide

financial support for their rescue have highlighted the declining population of whale sharks (Akhilesh et al., 2013).

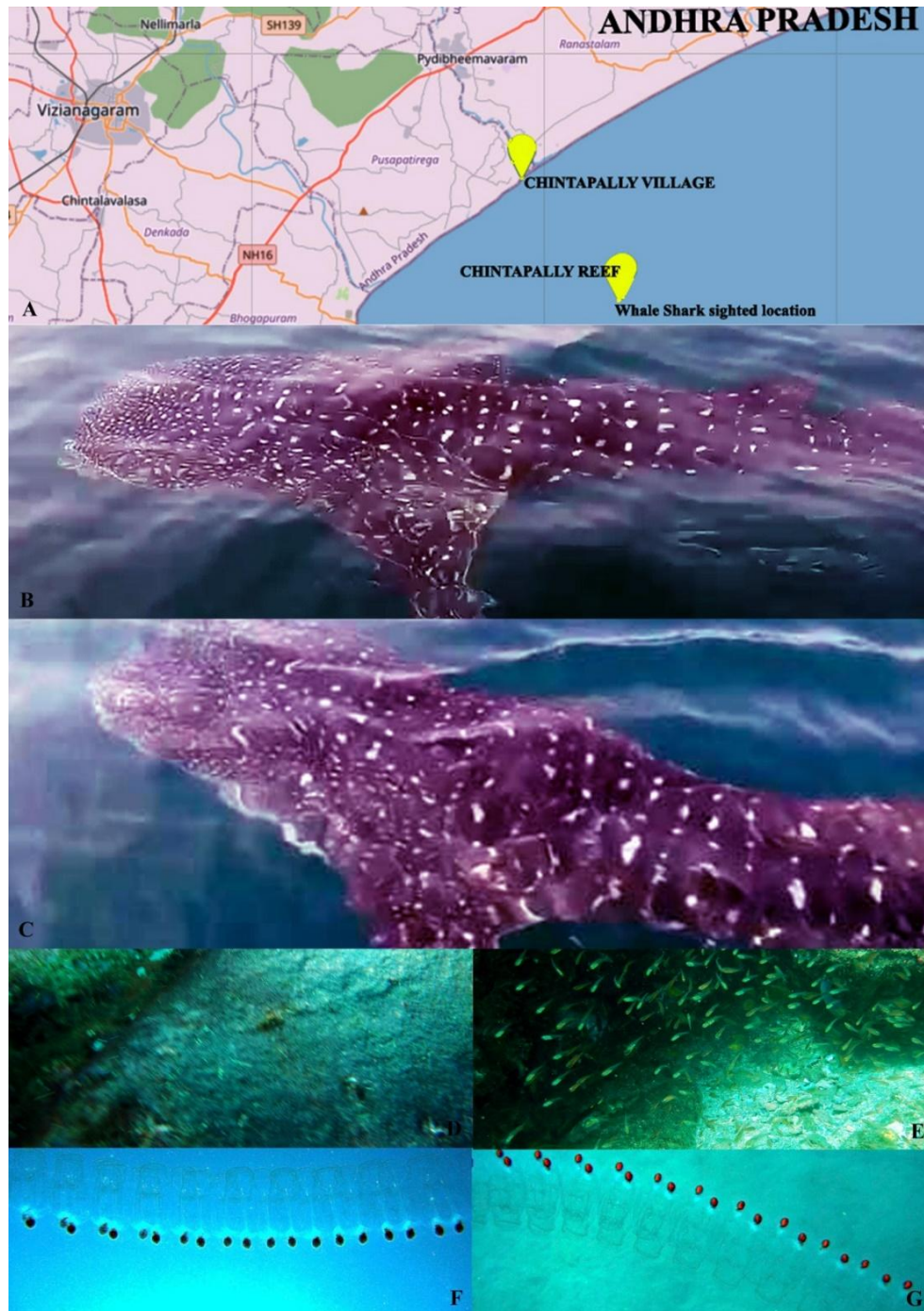


Figure 1 Whale Shark on the water surface sighted by Zoological Survey of India (A- Whale shark sighted location, B-C Live Whale Shark, D – Fish eggs mass, E – Juvenile fish schools, F-G - Tunicate *Salpa fusiformis* Cuvier, 1804).

2. MATERIALS AND METHODS

During the coral reef survey along the Andhra Pradesh Coast, Scientists from Zoological Survey of India spotted a medium-sized whale shark on January 24, 2023, surfacing near Santhapalli Rocks (Lat. 18°00.457 N; Long. 83°43.641 E), off Chinthapalli, Visakhapatnam (Figure 1A). The sighting of a whale shark coincided with the spotting of a school of juvenile fishes, fish egg mass and

planktonic tunicate salpa in the vicinity of the sighting as observed with the help of SCUBA diving at a depth of 10 to 15 meters (Figure 1B-G).

The atmospheric temperature was 29°C, the sea surface temperature was 27°C, and the water salinity level at the surface was 36‰ in the sighting area. The length of the individual was approximately 5 meters based on the boat length of 7 meters from which the individual was sighted. Based on its size, it can be concluded that the individual was a juvenile. Nearly 25% of whale shark sightings along the Indian coastline are of individuals ranging in length from 5 to 10 meters (Akhilesh et al., 2013). To understand whale shark sightings and conservation efforts along the Indian coast, the published literature from 2012 to 2022 was reviewed.

3. RESULTS

In India, between 1990 and 2000, a significant number of 1974 whale sharks were reported as killed, with a staggering 94.6% of these incidents confirmed along the Gujarat coast, followed by Tamil Nadu (2%) and Andhra Pradesh (1%) (Pravin, 2000). However, from 2000 to 2011, the number of whale shark fishing incidents notably declined, totaling only 79 individuals during this decade. Kerala reported the highest number of deceased whale sharks (39%), followed by Tamil Nadu (22%), Andhra Pradesh (11%), and Maharashtra (8%). Notably, a conservation project initiated in 2004 by the Wildlife Trust of India aimed at rescuing whale sharks along the Gujarat Coast yielded substantial progress, resulting in the rescue of 300 whale shark individuals from 2005 to 2011 (Akhilesh et al., 2013; Matwal et al., 2013).

Recent data compiled from literature sources indicated that within the most recent decade, 115 whale sharks perished, while 397 were successfully rescued from various incidents along the coastline. Data for the states of Maharashtra and West Bengal seem unavailable for this period despite reported whale shark occurrences in both states. Alarming, 71% of the recorded deceased whale sharks during the last decade were reported in Andhra Pradesh. The primary cause attributed to this high number of fatalities is the Godavari estuarine region, significantly impacted by extensive local fishing activities in Andhra Pradesh. Shark mortality in this area is largely considered a byproduct of these fishing practices (Table 1).

Table 1 Decadal record of whale shark incidents from the Indian Coast

Sl No.	Year	State	Location	Condition of sighting	Number of Individual	Reference
1	2012	Gujarat	Gujarat Coast	Rescued from fishing gear	59	(Matwal et al., 2013)
2	2013	Gujarat	Gujarat Coast	Rescued from fishing gear	13	(Matwal et al., 2013)
3	2013	Tamil Nadu	Injambakkam Pamban, Vedhalai	Dead (2), Rescued (1)	3	(Oppili, 2013)
4	2014	Kerala	Kollam	Dead	4	(Pereira, 2014)
5	2014	Karnataka	Panambur beach	Dead	1	(Mohit, 2014)
6	2013-2016	Andhra Pradesh	Kakinada	Dead	79	(Masood, 2022; Sankar, 2015)
7	2016	Tamil Nadu	Kunthukkal	Dead	1	-
8	2016	Orissa	BaidharaPentha beach	Dead	1	(Indo-Asian News Service, 2016)
9	2016	Gujarat	Mandavi Beach	Dead	1	(PTI, 2016)
10	2017	Tamil Nadu	Thoothukudi, Kunthukal Beach, Mookaiyur Beach, Pamban	Dead	4	(The Hindu, 2017a; The Hindu, 2017b; Press Trust of India, 2017)
11	2014 -	Gujrat	Gujarat Coast	Rescued	317	-

	2018					
12	2018	Orissa	Ganjam	Rescued	1	(Das, 2018)
13	2019	Tamil Nadu	Kasimedu harbour (Chennai), Inigo Nagar (Thoothukudi)	Dead	2	(The Hindu, 2019a)
14	2019	Karnataka	Surathakal	Dead (1), Rescued (1)	2	(The Hindu, 2019b)
15	2019	Orissa	Ramachandi beach	Dead	10	(Senapati, 2019)
16	2020	Tamil Nadu	Athankarai (Ramnathapuram)	Dead	1	(Ganesh, 2020)
17	2020	Orissa	Baradia river, Sunapur	Dead	2	(Senapati, 2021; The Hindu, 2020a)
18	2020	Pondicherry	Thengaithittu fishing harbour, Vambakeerapalayam coast	Dead	2	(The Hindu, 2020; 2020b)
19	2020	Andhra Pradesh	Tantadi village	Rescued	1	(Ganguly, 2021)
20	2020	Kerala	Koyilandi, Shanghumugham Beach	Rescued	2	(Priyadershini, 2020; Unnithanan, 2020)
21	2021	Pondicherry	Veerampattinam	Dead	1	(The Hindu, 2021)
22	2021	Orissa	Ramatara beach, Chandipur beach, Paradeep	Dead	3	(Senapati, 2021)
23	2022	Andhra Pradesh	Tantadi village, Srikakulam	Rescued	2	(Pandey, 2022; The Hindu, 2022b)

3. DISCUSSIONS

In India, the primary focus of whale shark conservation has been directed towards the west coast, notably in Gujarat, owing to identified potential breeding sites. More recently, attention has extended to the Kerala coast, attributed to the migration route of whale sharks through the Lakshadweep seas (The Hindu, 2022a). Although conservation efforts for whale sharks along the eastern coastline have historically received less emphasis, a shift occurred in February 2022 when the Andhra Pradesh Forest Department initiated compensatory measures for fishermen and introduced a dedicated app to facilitate conservation efforts and compile sighting data of whale sharks. Local fishermen along the Andhra coast have reported sightings of whale shark pups, suggesting the existence of potential breeding grounds not only on the West Coast but also on the East Coast, urging efficient management for the conservation of whale shark populations (Pereira, 2014).

According to the fishing community in Andhra Pradesh, sightings of whale sharks notably increased in the region post-winter from 2021 onwards (Oppili, 2013). The altered migration pattern remains unexplained due to the limited understanding of shark biology. However, it is hypothesized that planktonic bloom and rising temperatures during this time of year may facilitate whale shark breeding and migration. Scientists from the Zoological Survey of India (ZSI) have verified the presence of *Salpa fusiformis* Cuvier, 1804, a type of tunicate, juvenile fishes, and fish eggs near the area where whale sharks have been sighted recently, indicating the availability

of food (plankton) in these regions (Figure 1F, G). The Godavari estuarine region, characterized by a mangrove ecosystem, and the coastline of Andhra, protected by numerous reef habitats, are identified as natural breeding grounds for this species.

4. CONCLUSIONS

However, the discussion highlights a noticeable surge in the population and occurrences of whale sharks along the east coast of India. Notably, the Godavari estuarine region stands out due to its abundant fishing resources in canals and creeks, where overfishing and the utilization of hook fishing, mechanized boats, and uninformed fishermen have significantly contributed to the decline of whale sharks in this area. It is imperative to prioritize effective conservation measures for this endangered species in the Godavari estuarine region and the broader eastern coast of India. This can be achieved by fostering local awareness and engaging local authorities to promote sustainable fishing practices, thereby addressing this critical situation.

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Authors' Contributions

Author JSYK surveyed and collected the evidence finalized the manuscript. Author AS and GA literature survey and manuscript preparation, CR overall supervision and coordinated the project.

Ethical approval & declaration

In this article, as per the animal regulations followed in National Centre for Coastal Research, Chennai, India & Zoological Survey of India, Sunderban Regional Centre, Canning – 743329, West Bengal, India, the authors observed a whale shark sighting was recorded off the coast of Andhra Pradesh along the east coast of India. The Animal ethical guidelines are followed in the study for species observation, identification & experimentation.

Informed constant

Not Applicable

Conflicts of interests:

The authors declare that there are no conflicts of interests.

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Supplementary Materials:

To view the supplementary video, log-in to your Facebook account, then check the URL. The supplementary video available at URL: <https://www.facebook.com/discovery.journals/videos/3795559694035596/>.

Data and materials availability

The specimens not collected and the photo documents available at the Sunderban Regional Centre, Zoological Survey of India.

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